BLUETOOTH BASED HOME AUTOMATION USING ARDUINO

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ABSTRACT

Modern technology is progressing now a days. To develop a system that will benefit humans utilizing current technologies. This paper describes the development of an inexpensive, user-friendly, and secure home automation system based on Android. The project is implemented with the help of Arduino Bluetooth board and the home appliances are connected to 4 channel relay module. Wireless connection is created for communication between the Arduino Bluetooth board and the Android phone. This project is meant to be economical and Control of a measurable range of devices with few improvements to its operations. To prevent unauthorised users from accessing the equipment at home, password protection is required. In this paper work one advanced feature is added that is the effective usage of EEPROM.

Keywords: Home Automation, Smartphone, Arduinouno Controller , Hc-05 Bluetooth Module, 4 Channel Relay Module , DC Adapter, Home Appliances.

I.   INTRODUCTION

Now we are in 21st century, earlier we more familiar with mechanical control system technology. Now we would like to update the conventional old technology to advanced technologies and control systems to improve the humans lifestyle. Because of the quick advancement of technology, we can now remotely control household appliances using our smart phones. An autonomous device can operate with low latency and more accurate controlling. Researchers and home appliance manufacturers are concerned about the concept of home automation systems. In addition to enhancing human lifestyle, automation systems also save time and energy. Earlier we used to provide assistants for old age people and physically challenged ones, but now a days it has been changed. The major objective is to provide older persons and people with physical disabilities the means to perform daily duties and remotely operate household appliances. It is cost-effective to build and simple to install a Bluetooth-based wireless home automation system in an existing house. According to my studies suggest that Bluetooth systems are better than IR-controlled and GSM systems. Depending on the type of Bluetooth device, Bluetooth technology has a physical range of up to 10 metres and a data transmission rate of up to 3 Mbps. The Arduino board, a Bluetooth module, and a smartphone application are the basis of the operational plan. The Arduino board is connected to the Bluetooth module HC-05, and the 4 channel relay module is connected to the home appliances. An application for smart phones is used to facilitate communication between the devices. The smartphones are connected to an Arduino board through Bluetooth.

II.   RELATED WORK

Many remotely operated home automation techniques have been taken into account. D.Chowdhary and P.Laforge according to study, it is possible to wirelessly manage home appliances with an Arduino uno and a mobile phone. According to those research Arduino board attached to a home appliance was controlled by an SMS application. Another study suggested a smart home system that employed Bluetooth and an android application. However, this was only done for four lights, and it was ineffective for managing more than four household appliances. Another study described a wifi-based smart automation systems for elderly and physically challenged people. Wireless connectivity between the master control panel board and the remote control device was performed using WiFi transceivers.

Researchers wants to build a low-cost, wirelessly operated smart automation system. The employment of clever automation technologies allowed for the provision of wireless remote control access to consumers. From the above all research papers work we implemented a new technique is introduced to the existing Home automation systems that is the effectively usage of EEPROM. Due to this EEPROM we can avoid the previous existing state of the appliances when power failure happens. Even though this technology is affordable, it provides more accurate control.

III.   SYSTEM DESCRIPTION

Hardware and software make up the two primary components of the home automation system. The hardware is separated into four main parts an arduino Uno controller board, a HC-05 Bluetooth module, 4 channel relay module, and a smart phone. The integrated development environment(IDE) is responsible for programming of arduino micro controller and Bluetooth module is required for receiving the data from Smart phone application and send collected data to arduino controller . the total transaction which is used for wireless communication between smart phone and Arduino Uno board, MIT App inventor and Proteus simulator.

IV.   HARDWARE ARCHITECTURE

This paper explained home automation system consists off four hardware components smart phone, Arduino Uno controller board HC-05 Bluetooth module and 4 Channel relay module. Smart phone is used to communicate with Arduino controller board and Bluetooth technology. For the hardware design in this research project, the HC 05 Bluetooth module and Arduino Uno micro controller are used.

1. Arduino IDE

The Arduino IDE is a tool for creating computers that are more capable than your desktop computer of understanding and controlling the physical world. It is an freely available platform built on a basic microcontroller board with an integrated development environment for developing controller board programming. Arduino can be used to build prototype devices by taking inputs from switches or sensors and producing outputs from a range of household appliances, such as lights, motors, and other physical devices. Stand-alone Arduino projects are available, or it can communicate directly with software that is running on host operating sysytem (e.g.Flash, Processing.)
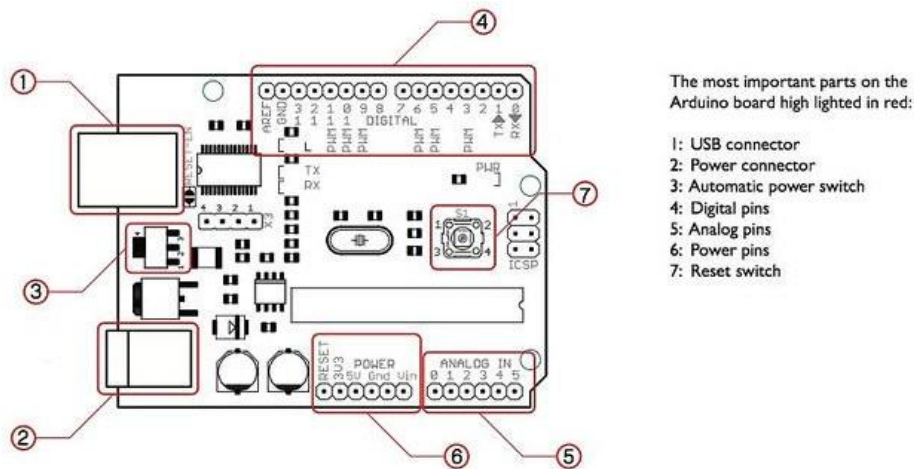

Fig 1. Arduino Uno Controller Board

The controller boards can be designed by hand or buy in e commerce portals; The software is available for free online download. A microcontroller board called the Arduino Uno has an IC called the ATmega328. It contains 6 analogue inputs, a 16 MHz ceramic crystal oscillator, a USB connection, a power jack connector, an ICSP header, and a reset push button. It has 14 digital input/output pins, of which 6 are used as PWM outputs. Everything required to support the microcontroller is present; simply use a USB cord to connect it to a computer or power it with the help of a AC-to-DC adapter or battery to turn ON the controller Board.

2. HC-05 Bluetooth Module

The HC-05 Bluetooth module is necessary to create wireless connection between an Arduino Uno and a android mobile phone. The slave component of Bluetooth module HC-05 may operate between 3.3 and 6 volts in power. There are six pins on it: RXD, State, TXD, VCC, GND, and EN. Connect the RX of the Arduino Uno micro controller to the TXD pin of the HC-05 Bluetooth module for serial communication and RXD pin with TX of Arduino Uno controller. Connections of arduino uno and HC-05 Bluetooth module is explained below.
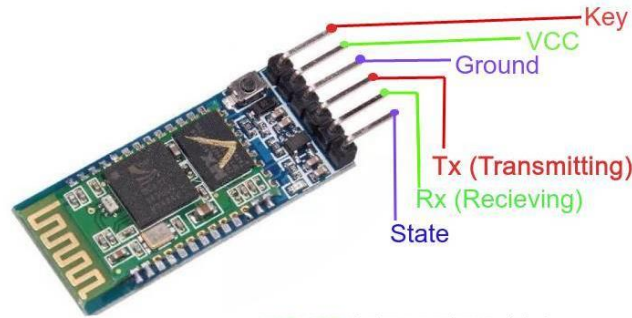
Fig 2. HC-05 Bluetooth Module

When the Bluetooth module is powered ON then it will search the master commands that are given by the user with the help of android mobile. The blue tooth working commands are already exists in the flash memory of the Arduino controller. Once the user given commands by connecting the Bluetooth module then the data will be transferred to arduino Uno controller.

3. Four Channel Relay Module

Four-channel relay Board is connected using connecting wires to the Arduino Uno controller's output digital pins. It contains 4 relays for the project's switching application. This board's very small size makes it suitable for small spaces, and it is primarily designed for low voltage applications. It contains the opto coupler isolation which gives the isolation to the mains power supply and other components. Because of the opto couplers used to protect the other components

Features:

a. Interface board for a 4-channel relay, each relay requiring a driving current of 15-20 mA
b. The module can be operated 5V input Voltage
c. The module can handled high-current relay, 10A ,AC250V ;DC30V 10A
d. Opto- coupler isolated inputs
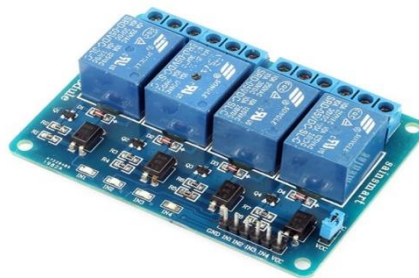e. LEDs that indicate the relay output condition.

Fig 3. Four channel Relay Module

V. SOFTWARE ARCHITECTURE

In this project, to establish communication between the Arduino micro controller board and the Bluetooth module the following three softwares were used.

1) Arduino IDE

Integrated Development Environment tool is referred to as an IDE by using this tool entire programming for proposed system is done. The required Baud rate for serial communication between an Arduino Bluetooth module and a smart phone is 9600 bits per second. The sample Arduino commands were discussed. When the serial data is available or not explained from the adjacent instruction "Serial.available( )> 0" means that receive data serially from smart phone via Bluetooth   and "Serial.println( )" instruction is described that to send data serially from Arduino controller board to smart phone.

State variable is to get the value from smart phone to store the values and then compare with different condition and execute the required task as per the program code logics.

```
if (val == '0') //for decision checking
{
Serial.println("LIGHT1 IS ON"); digitaIWrite(LIGHT1, HIGH);  // Light1 gets ON
}
if (val == '1 ') // for decision checking
{
Serial.println("LIGHT1 IS OFF"); digitaIWrite(LIGHT1, LOW); // Light1 gets OFF
}
```

2) Proteus Simulator

The project hardware can be implemented with the help of proteus software. In the software all the required components are taken from the component library of the software and connect the component blocks as per the circuit diagram. Now compiled hexa decimal code will be import in the flash memory of the arduino board and give run command to simulator.

3) MIT App Inventor

The Massachusetts Institute of Technology presently maintains an integrated development environment for web applications previously made available by Google under the name MIT App Inventor (MIT). It allows beginners in computer programming to produce software applications (apps) for the Android and iOS operating systems.

VI. PROPOSED METHODOLOGY

When the circuit is getting powered, then the Arduino loads the corresponding libraries and switches relays to OFF position. Arduino will waits for the command values to be received from the smart phone via Bluetooth module. The four appliances are declared as state values like numericals. If either state variable is obtained as a string from the Bluetooth module, the status of the respective appliance will be toggled.
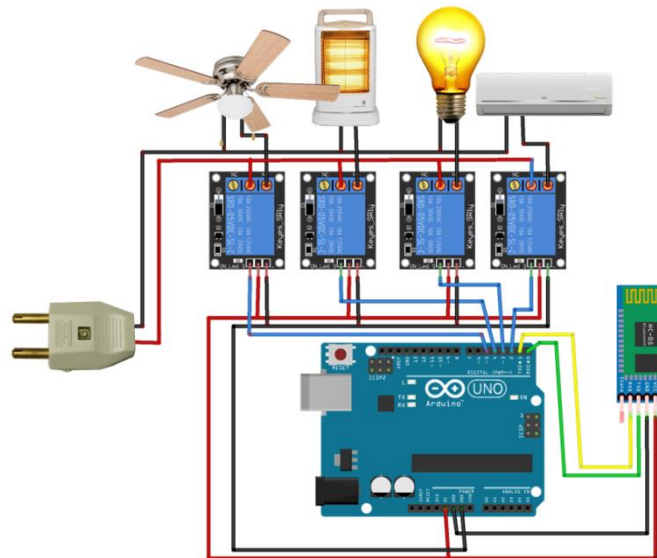

Fig 4. Circuit Diagram of Home automation System

VII. RESULTS

The end result of this paper explains the implementation of smart home automation, as per the suggested plan. In order to make it simple for us to operate home appliances such lights, fans, tube lights, air conditioners, bulbs, televisions, and refrigerators, an automation system has been developed through this paper.
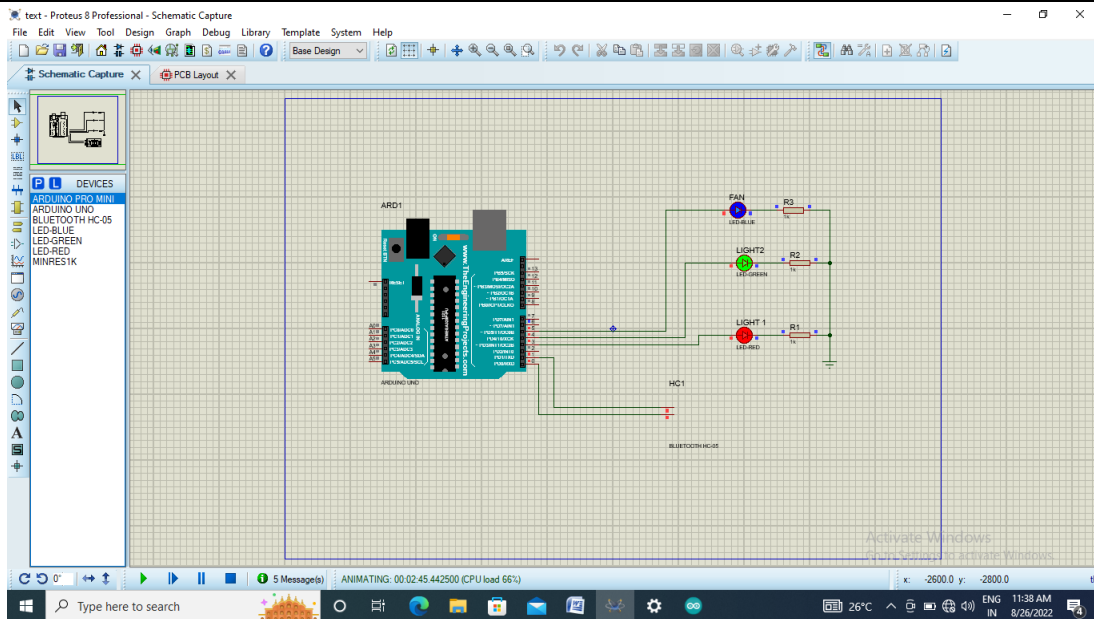
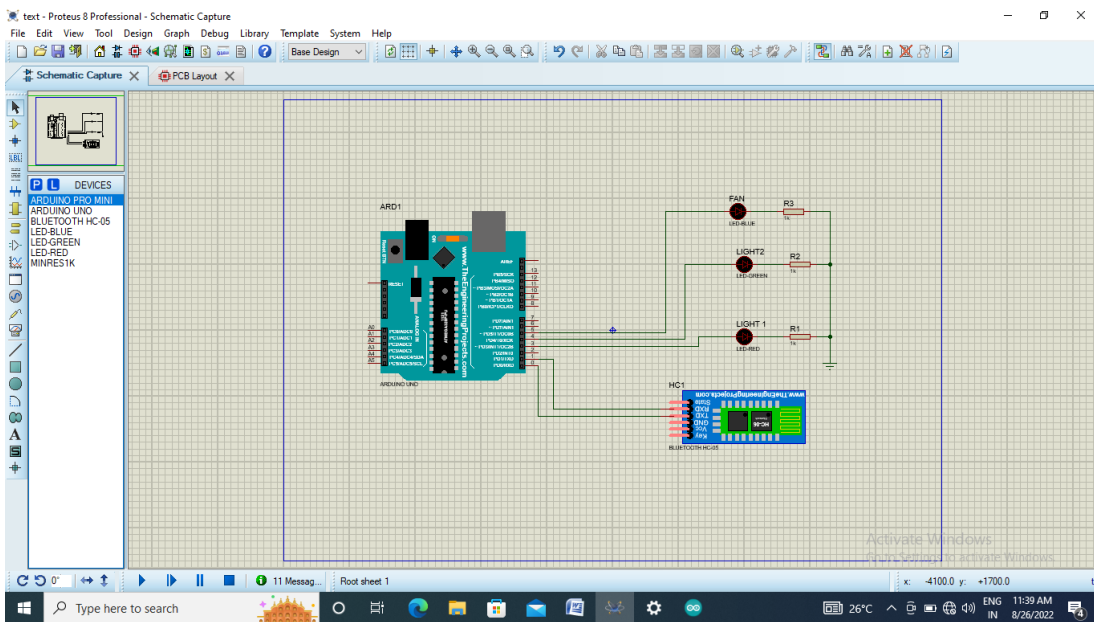**Fig 5.** Proteus simulator output while running

Fig 6. Proteus simulator output while in standby condition

According to this paper work one new feature is added to the source code that is an effective usage of Electrically Erasable programmable Read Only Memory (EEPROM). EEPROM is acts like a flash memory and stores the data receives from the Bluetooth module while running when the power interruption occurs EEPROM the stores information and stops the execution. It will continue the process after Interrupt Service Routine clear it will start previous process of execution. By using ISR technique the project is developed.

Fig 7. Hardware Implementation of Home Automation System

VIII.   CONCLUSION

From the results, it can be deduced that home automation refers to a particular type of device that requires extra effort to operate in order to operate home appliances such as fans, air conditioners, lights, and televisions. And in this paper work, demonstrated how to build the home automation system, discussed about operation and its application in a better way. In this work, advantages are latency of the controller improved and while execution of the process if the power interruption occurs, the controller will stop execution and when the power interruption clear then the controller will continue the execution process where it will stops earlier.

IX.   REFERENCES

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